SCIENCE

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SCIENCE

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DIRECT REFLECTING POLARISCOPES.

POLARIZATION by reflection is more perfect than by transmission through thin plates, unless a large number of plates are used, and in that case there is difficulty in finding plates free from color. The disadvantages of reflection are (1) the "elbow" angle and (2) the impossibility of rotation of the polarized beam. Both these objections are overcome in the forms here described, which may be attached to the lantern by a sliding collar and rotated almost as easily as a Nicol.

In Fig. 1, *p* is a bundle of thin glass plates, set at the polarizing angle; *m* is a silvered mirror. Either the reflected

FIG. 1.

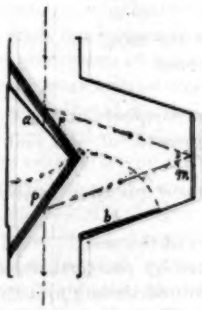

FIG. 3.

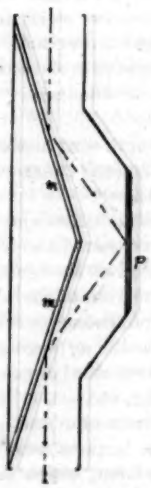

FIG. 2.

or the transmitted beam may be used; or, if the mirror is slightly movable, the two images may be thrown either side by side or superposed upon the screen.

In Fig. 2 the bundle of plates, *p*, has a black backing, and there are two silvered mirrors, *m*, *m*. The reflected beam only is used.

The form shown in Fig. 3 is more complicated and clumsy in appearance, but it has the advantage of keeping either the reflected or the transmitted beam, or both, in the axis of rotation. *a* and *b* are movable blackened screens.

T. PROCTOR HALL.

Clark University, Worcester, Mass.

PROFESSOR A. S. HARDY of Dartmouth, who has been spoken of for president of the college, has decided to leave Hanover and take a new professorship at West Point.

NOTES ON THE FERTILITY OF PHYSA HETEROSTROPHA SAY.[1]

ON the 8th of March, 1886, I collected from a marsh near Wake Forest two specimens of Physa heterostropha Say. On the 16th three thick nidamenta, of some forty eggs each, were seen loosely attached to the walls of the glass aquarium. A few days later four others had been deposited. Up to June 15 the aquarium was examined at intervals nearly every day. After that date it was not seen again until July 12, when the water was changed. The next day both the snails were dead, probably as the result of the change of water.

In the period of four months — say March 12 to July 12 — the pair produced 43 nidamenta, which contained, on an estimate certainly not too high, an average of 30 eggs each, so that the number of their offspring for the period mentioned amounted to 1,290. There was no well-marked decline of the reproductive function toward the close of the period, which is perhaps another indication that they came to their death by violence.

From March 31 to June 6 inclusive, the pair were observed in coitu as many as fifteen times, at hours ranging from 8.30 A.M. to 6.15 P.M., the coitus lasting sometimes but twenty minutes, sometimes more than an hour. The male function was performed alternately by the two snails. The eggs appear to have been laid only during the night.

It was important to determine, if possible, the age at which sexual maturity is attained and reproduction begins. Accordingly, on the 12th of July I took out of the aquarium two of the largest of the young snails and put them into another aquarium. They were presumably members of the first brood, the eggs of which were deposited near March 13. Their age, reckoning from the time they were hatched, was about 3½ months; size, length of shell, 5 millimetres; length of foot, 6 millimetres. In two days one of the snails was dead. On the 25th of July another snail of about the same size was introduced from the first aquarium. The next entry in my notes is under date of Sept. 11, when six nidamenta were observed attached to the fibrous roots of a water plant. They were, however, small, containing only from one to four eggs each, showing that the reproductive function at that age was feeble. Some of the eggs were already hatched, and the tiny grandchildren of my first Physas were going about the aquarium in search of food. Allowing, say, fifteen days for the intracapsular development of these snails of the third generation, I estimate that the isolated pair of the second generation attained sexual maturity at five months of age. The same day — Sept. 11 — in the first aquarium I noticed a confirmation of my observation in the second, namely, the pairing of two of the oldest brood.

The maintenance of a species depends on the equilibrium between the forces tending to its destruction and those tending to its preservation. We may embrace the former under the general phrase, adverse external conditions. There are two different ways in which the destructive tendency of these adverse external conditions is opposed. The first is by adap-

[1] Abstract of a paper read before the Elisha Mitchell Scientific Society in session at Wake Forest, . ., Oct. 23, 1891.

tations of structure and habit. The second is by the production of new individuals to take the place of those that have been overcome. Now, as different animals exhibit varying degrees of ability to adjust themselves to their environment, so also their reproductive power may be small or great. In estimating this reproductive power four factors, as Herbert Spencer points out,[1] are to be taken account of, namely, (1) the age at which reproduction commences, (2) the frequency with which broods are produced, (3) the number contained in each brood, and (4) the length of time during which the bringing forth of broods continues.

Accordingly, for the special case of Physa heterostropha we have the following results: —

1. Age at which reproduction begins, 5 months.
2. Frequency of broods, 1 in about $2\frac{7}{10}$ days.
3. Number in each brood, 30 average.
4. Reproductive period, 4 months, March to July.

Some addition ought to be made to this actually observed period, inasmuch as the snails had certainly already entered upon it at the time of their capture, and, further, instead of closing normally, it seems to have been violently interrupted. Just how much the period of reproduction is to be extended I have no means of determining, unless the fact that the young snails of the first brood were observed reproducing themselves in September warrants an extension of at least two months, making it six months instead of four.

Assuming, then, that the reproductive season extends from March to September, and assuming, further, somewhat arbitrarily, that the snail lives but two years, we have, on the basis of facts above mentioned, the following estimate of the total number of the offspring of a single pair: —

At close of first season	1,900
950 pairs at close of second season	1,805,000
Original pair at close of second season	1,900
Total number of offspring in two years	1,808,800

W. L. Poteat.

Wake Forest College, N.C.

NEBRASKA SUGAR SCHOOL.

Professor Lloyd has just made the first formal report of the sugar school at the State university, Lincoln, Neb., of which the following is a summary: The school opened on Jan. 5 with an enrollment of twenty-five students. These students were mostly members of other classes in the chemical department of the university; the only preparation required for entrance being a clear conception of the principles of elementary chemistry, such as may be obtained in some of the high schools of Nebraska.

The course consisted of two lectures a week, with five hours of laboratory work. The lectures as given by Mr. Lyon embraced the following subjects: 1. Chemistry of the sugars; 2. technology of beet-sugar manufacture; 3. culture of the sugar beet.

The lectures under the first head were designed to give the students an idea of the position of sugars as a class in the series of compounds of carbon, and their relation to others of these compounds, together with a knowledge of the properties and characteristics of each of the sugars.

The cause and effects of fermentation upon sugar solutions were carefully studied. Other important principles relating to the manufacture of sugar, as the compounds of the sugars with lime, melassigenic action, etc., were taken up in order to prepare the student for the complete understanding of the practical application of these principles in sugar factories.

[1] Biology, Vol. II., p. 395.

A discussion of the methods of the analysis used in the laboratory was given from time to time throughout the course.

Under the second head of lectures, the various processes that the beets, juice, and sugars undergo from the washers to the granulator were studied in detail. Both the French and German forms of machinery were described. As each process was studied, the methods of the analysis of its products and by-products was referred to. The study of sugar-house control was in this way presented to the student.

During the latter part of the winter term, Professor DeWitt B. Brace gave the class four valuable lectures on the theory of light. His lectures included the following subjects: 1. The wave theory of light; 2. polarization of light; 3. rotation of the plane of polarization; 4. application of these principles to the polariscope and to the different forms of saccharimeters.

The lectures were finely illustrated by means of the apparatus in possession of the physical laboratory. This course in the physics of light was followed by lectures in the chemical department on the use of the saccharimeter, methods of setting prisms to obtain a clear field, adjustment of the compensating wedges, methods for testing the accuracy of instruments.

The laboratory work of the course consisted in analyses of the various products and by-products of the sugar factory. The samples used were obtained from the Norfolk sugar factory during the last campaign. One of the students did some advance work in the absorption of sucrose by bone black and the volume of the lead precipitates.

The spring term was devoted to a course of lectures on the culture of the beet. This course embraced the following topics:

1. Origin and history of the beet.
2. External characteristics of a good sugar beet, its roots and foliage.
3. Composition and structure of the root.
4. Relation of the leaves to the root.
5. Food of the plant.
6. Relation of the plant to the atmosphere and to the soil.
7. Conditions governing the growth of the plant, and changes during vegetation.
8. Fertilizers, preparation of the soil, planting, cultivating, thinning, etc.
9. Production and improvement of the seed.

These lectures were supplemented by practical work at the station farm, which may be continued throughout the summer at the option of the student. The course closed May 6.

Encouraged by this prosperous beginning of the first beet-sugar school in the United States, it is hoped that in the coming year the work may be greatly extended. Several students who have taken the course outlined are thoroughly prepared to do polariscopic work in sugar factories.

SECONDARY BATTERIES.[2]

When a lead-peroxide cell is discharged, sulphate of lead is the ultimate product on both plates, and when it is charged again this lead sulphate is oxidated on one plate and reduced on the other. This fact was published in 1882 by Dr. J. H. Gladstone and the late Mr. Tribe in *Nature*. Taken by itself, however, it does not explain how it is that during charge the potential difference of a cell will rise rapidly from 2.1 volts to 2.13 volts, then slowly to 2.2 volts, and

[2] From Engineering of May 20.

afterwards rapidly to 2.4 volts, or even higher. Upon disconnection of the charging current the potential difference drops suddenly to about 2.1 volts, and then on discharge falls rapidly to 1.95 volts. The main part of the discharge takes place between 1.95 and 1.9 volts, and if it be continued beyond the latter point the potential difference rapidly falls to 1.6 volts, the gradient below 1.8 volts being very steep. Last week, and again yesterday, Dr. Gladstone showed the Institution of Electrical Engineers that the variations in the strength of the sulphuric acid are the main causes of the variations in the electro-motive force. Starting with a properly formed cell which has been discharged, there are two leaden supports; on one of these is a mixture of lead sulphate ($PbSO_4$) with more or less lead peroxide (PbO_2); on the other is also a mixture of lead sulphate with more or less of spongy metallic lead. Each of these mixtures is a porous layer. The act of charging converts the lead sulphate on one plate into PbO_2, and on the other into spongy lead. In the operation there is an abundant formation of sulphuric acid in the pores of each plate, while an equivalent amount of water disappears. In addition to this chemical effect sulphuric acid is, by electrolytic action, heaped up against the positive (peroxide) plate, and withdrawn from the neighborhood of the negative (spongy lead) plate. The increase of acid strength around the positive plate was proved experimentally by the author, while it is matter of common knowledge that the density of all the liquid in a cell rises during charge.

When a cell is fully charged and left to stand, the strength of the acid commences to equalize itself through the liquid. This is brought about by three causes — diffusion, local action, and reduction by H_2O_2. These actions occur at the positive plate, where the acid in the pores works out, at first rapidly and then more slowly. At the same time energetic local action is set up between the PbO_2 and its supporting lead frame, with the formation of sulphate of lead, and the consequent absorption of sulphuric acid from the liquid. The temporary evolution of oxygen gas from a well-charged plate has been attributed to the reaction of hydrogen dioxide on peroxide of lead. At the negative plate equalization of acid strength takes place by diffusion, and also by a direct, slow, chemical action of the sulphuric acid on the lead, producing lead sulphate and hydrogen gas. This latter gas, being formed in the pores of the spongy lead, chokes them and hinders the diffusion of the acid, rendering it very slow.

During the discharge of a cell all the causes just enumerated as tending to produce equalization of acid strength, continue in operation, and to them is superadded the ordinary discharge reaction of the cell. At the positive plate the lead peroxide, with sulphuric acid existing in its pores ($PbO_2 + H_2SO_4$), becomes sulphate of lead and water ($PbSO_4 + H_2O$). At the negative plate spongy lead with sulphuric acid in its pores ($Pb + H_2SO_4$) also becomes sulphate of lead and water ($PbSO_4 + H_2O$). Further, by electrolytic action sulphuric acid is transferred from the PbO_2 to the Pb plate. The excess of acid originally about the PbO_2 plate rapidly disappears by these various agencies, and the acid on both plates is reduced pretty nearly to the same strength as that of the intermediate liquid. After this there is a gradual withdrawal of acid from the liquid in the pores, more or less compensated by diffusion inwards from the intermediate liquid. This brings about the reduction in the strength of the whole acid, which is well known to take place during discharge. The strength of the acid in the pores will be determined by the relative values of the rate of withdrawal and the rate of diffusion. But while the rate of withdrawal continues constant for a given current discharge, the rate of diffusion rapidly diminishes. The rate of weakening of the acid is, therefore, a constantly increasing one, and may finally become so rapid that the acid strength of the liquid against the working surfaces of the plates is very low, or almost *nil*.

It being shown that the strength of the acid against the plates of a secondary battery is constantly varying during charge, repose, and discharge, the authors of the paper, from which we have quoted, set themselves to prove experimentally that a change of electro-motive force is produced by a change in the strength of the acid. Taking a pair of fully formed and carefully washed plates they were placed in a series of solutions of gradually increasing strength of acid, and left in each for fifteen minutes. The acid strengths and electro-motive force are given in the following table: —

Percentage of Acid.	Electro-motive Force (Volts).
6.5	1.887
9.5	1.898
11.5	1.915
16.2	1.943
21.7	1.978
29.2	2.048
33.7	2.088
43.0	2.170

In a second set of experiments the Pb plate was kept in acid of 14.0 per cent strength, while the acid around the positive plate was varied from 6.5 to 81 per cent. The result confirmed those of the first set of experiments, but it was shown that the electro-motive force depends on the strength of the acid at both electrodes. Several other series of experiments were made in different ways, but all confirming the opinion that change in acid density was accompanied by a change of electro-motive force.

We have not space to follow Messrs. Gladstone and Hibbert through the vast amount of confirmatory evidence they adduced from their own experiments, and from the records of the researches of others, in support of their hypothesis. We may, however, notice one point. Applying Lord Kelvin's law as to the relation between the electro-motive force of a cell, and the thermal value of the chemical actions contributing to it, they find that the voltage of a PbO_2 — Pb cell, in which there was nothing but pure H_2So_4, would be 2.627; by experiment they made it 2.607 volts. With pure water in the cell the result is, by calculation, 1.35 volts; by experiment, 1.36 volts. In charging an accumulator the current has, as already shown, to do extra work in concentrating H_2SO_4 at the PbO_2 plate, and the energy equivalent to that work must be obtained from an increased potential difference. This explains how it is that potential difference is so much greater during charge than during discharge. For a dyad gramme equivalent of H_2SO_4, concentrated from a 10 per cent solution to 100 per cent, about 17,000 calories will be needed, equal to .37 of a volt. The calculated charging electro-motive force must, therefore, be at least 2.3 volts.

The lesson to be learned from the paper is the desirability of promoting diffusion in the liquid of the cell, so as to keep the whole of the same density. At present the heavy acid slides down the PbO_2 plate and accumulates at the bottom. This leads to differences of current density in different parts of the plate, and will also give rise to potential differences

on each of the plates, and thus produce local action and the formation of lead sulphate. It would not be a difficult matter to effect such diffusion, and the experiment would be one of considerable interest.

NOTES AND NEWS.

THE annual meeting of the Society of German Men of Science and Physicians, according to *Nature*, will be held at Nürnberg from September 12 to 18. At the same time and place there will be a meeting of the German Mathematical Association. In connection with these meetings there will be a mathematical exhibition, including models, drawings, apparatus, and instruments used in teaching and in research in pure and applied mathematics. The project has the support of the Bavarian Government, and those who are organizing the exhibition have secured the co-operation of various competent men of science, and of the mathematical departments of some colleges, besides that of prominent publishers and well-known technical institutions. Space will be granted free of charge to exhibitors.

— Mr. E. H. Parker, the British consul at Kiungchow, in Hainan, a large island off the southern coast of China, mentions a curious phenomenon in connection with the tides of that port. The tides inside the inner harbor, as we learn from *Nature*, require several years of careful observation before they can be tabulated. It appears certain, however, that there are always two tidal waves a day, though one is so much more considerable than the other that the effect is often practically that of one single tide in the twenty four hours. The easterly and westerly currents through the straits are not necessarily connected with the rise and fall of the water, either there or in port. The phenomenon of "slack water" (*morte eau*) is also observable every ten days or so at Haiphong, and is probably owing to much the same causes as at Hoihow. At Tourane in Tonquin, too, it is popularly thought that there is usually but one tide within the twenty-four hours. This tide is felt away up to the citadel of Quangnam. In the Gulf of Tonquin the incoming tidal wave flows from the south, a fact which perhaps accounts for the singular circumstance that the westerly current in the Hainan Straits always sets for sixteen hours. One at least of the tidal waves from the east, which pass Hoihow, cannot get through the straits to Tonquin so soon as that portion of the same wave which takes a circuitous course by way of Annam.

— A Report of the State Geologist of Missouri, dated June 3, shows that much attention has been given to the study of the zinc and lead deposits, and in this connection examinations have been made in Jasper, Newton, Lawrence, Greene, and St. Francois Counties. In addition, detailed mapping has been prosecuted in Jasper County, and about 140 square miles have been covered during the past month. Further, there has been collected in Jasper County a large number of charts showing the location of mining properties, shafts, and ore bodies; and a great amount of statistical matter relating to these. The material thus acquired will be used in the preparation of the general report upon the zinc and lead deposits and also in the special report which will accompany the maps of Jasper County, now in preparation. In connection with the examination of the iron-ores, stratigraphic studies of the Ozark region have been prosecuted along the Big Piny and Gasconade Rivers in Texas, Pulaski, Phelps, Maries, Osage, and Gasconade Counties. In addition, iron-ore deposits have been inspected in Ripley, Carter, Wayne, and Butler Counties. The clays of the State have been subjects of further examination in both the field and the laboratory, deposits having been visited in St. Louis, Jefferson, Washington, Madison, Bollinger, Carroll, Chariton, and Randolph Counties. The study of the Quaternary geology of the State has been prosecuted in Jackson, Lafayette, Johnson, Macon, Randolph, and Saline Counties. In Greene and Polk Counties a small amount of systematic geological mapping has been done. The excessive rains during the past month have not only made all the field-work difficult and disagreeable, but have made certain work impossible, and have materially retarded the progress in other directions. It is greatly to the credit of the assistants of the survey that, notwithstanding the hardships endured and the difficulties overcome, such advance has been made. In the office the preparation of reports has been constantly in progress. This includes the original composition, the revision, and preparation for the printer, the correction of proof, the drawing of maps and illustrations. The reports which have thus specially received attention during the past month are: the report on the iron ores; the report on the mineral waters; the report on paleontology; the report on the Higginsville sheet; the reports on the Warrensburg, Iron Mountain, and Mine La Motte sheets; and the report on the crystalline rocks.

— At a meeting of the American Philosophical Society, Philadelphia, May 20, the following preambles and resolutions were read and considered: "*Whereas*, This Society did in the year 1843 celebrate the Centennial Anniversary of its foundation by a series of addresses, meetings, receptions, exercises, etc., upon the 25th, 26th, 27th, 28th, 29th, and 30th days of May, the results of which were published in a special volume of over two hundred pages; and, *Whereas*, We are approaching the Sesqui-Centennial Anniversary of the same auspicious event; therefore, be it *Resolved*, That the Society will celebrate the same in a worthy and becoming manner. *Resolved*, That the president be authorized to appoint a committee of five members to make all necessary arrangements for the same and with full power to act, and that the president be *ex-officio* a member of said committee." The preambles and resolutions, being considered by the society, were unanimously agreed to. The president subsequently appointed as said committee Messrs. Henry Phillips, Jun., chairman, J. Sergeant Price, Daniel G. Brinton, Richard Vaux, and William V. Keating.

— The usual monthly meeting of the Royal Meteorological Society was held on Wednesday evening, May 18. The following papers were read: (1) "Raindrops," by Mr. E. J. Lowe, F.R.S. The author has made over three hundred sketches of raindrops, and has gathered some interesting facts respecting their variation in size, form, and distribution. Sheets of slate in book-form, which could be instantly closed, were employed; these were ruled in inch squares, and after exposure the drops were copied on sheets of paper ruled like the slates. Some drops produce a wet circular spot; whilst others, falling with greater force, have splashes around the drops. The same-sized drop varies considerably in the amount of water it contains. The size of the drop ranges from an almost invisible point to that of at least two inches in diameter. Occasionally large drops fall that must be more or less hollow, as they fail to wet the whole surface inclosed within the drop. Besides the ordinary rain drops, the author exhibited diagrams, showing the drops produced by a mist floating along the ground, and also the manner in which snowflakes, on melting, wet the slates. (2) "Results of a Comparison of Richard's Anémo-Cinémographe with the Standard Beckley Anemograph at the Kew Observatory," by Mr. G. M. Whipple. This instrument is a windmill vane anemometer, and is formed by six small wings or vanes of aluminium, four inches in diameter, inclined at 45°, rivetted on very light steel arms, the diameter of which is so calculated that the vane should make exactly one turn for a meter of wind. Its running is always verified by means of a whirling frame fitted up in an experimental room where the air is absolutely calm, and, if necessary, a table of corrections is supplied. The recording part of the apparatus differs entirely from any other anemometer, and is called the Anémo-Cinémographe, and in principle is as follows: The pen, recording on a movable paper, is wound up at a constant rate by means of a conical pendulum acting as a train of wheel-links, whilst a second train, driven by the fan, is always tending to force it down to the lower edge of the paper; its position, therefore, is governed by the relative difference in the velocity of the two trains of wheel-work, being at zero when the air is calm, but at other times it records the rate of the fan in meters per second. The author has made a comparison of this instrument with the Standard Anemometer at the Kew Observatory, and finds that it gives exceedingly good results. (3) "Levels of the River Vaal at Kimberley, South Africa, with Remarks on the Rainfall of the Watershed," by Mr. W. B. Tripp. Measurements of the height of the River Vaal have for several

years past been made at the Kimberley Waterworks. These gaugings having been placed at the disposal of the Society, the author has compared them with the rainfall of the watershed. There is a marked period of floods and fluctuations at a comparatively high level from about the end of October to the latter part of April, and a period of quiescence, during which the river steadily falls with very slight fluctuations, from about Apr. 19 to Oct. 31. The highest flood, 525 feet, occurred in 1880, the next highest being 500 feet on Jan. 24, 1891.

— The admirable results which have attended the artesian borings in the Wed Rir, at Wargla, and more recently at El Golea in the Sahara, have led to a demand being made by the inhabitants of the Mzab in the southern part of the French Sahara, for the assistance of the Government in undertaking experimental borings in that region also. M. G. Rolland, one of the few geologists who have explored the Algerian Sahara, and the only one who has visited the extreme south, makes the following observations, reported in the Proceedings of the Royal Geographical Society, on the régime of subterranean waters between Laghuat and El Golea. From the north to south in the region of the Laya, and on the chalk plateau which extends to the south, borings have no chance of success. In the shebka of the Mzab and of Metlili, the conditions are only moderately favorable, and it would be necessary to penetrate down to 700, and even to 1,000, feet. To the south of the 32d parallel the chances of success increase in what M. Rolland calls the shebka of the south of El Hassi. Borings would undoubtedly succeed in the depressions of Dayet Tarfa, El Aref, Zubia, and Bu Fakrun. Further south, springing water would be obtained along the western border of the chalk reliefs, which is unfortunately complicated by the ramifications of the Western Erg, and the depths of the borings would go on decreasing until, on approaching the region of El Golea, it would be necessary to penetrate down only to 400 feet.

— The United States Consul-General at Seoul, in his last report, says that paper manufacture is one of the leading industries of Corea. This paper is highly esteemed, and always forms part of royal presents, and of the tribute paid to China. Besides its use for writing and for books, it is employed in a great diversity of ways. It serves as string, and in the manufacture of lanterns, fans, umbrellas, shoe soles, hats, boxes, and coats. It is also used for covering floors, walls, and ceilings, and, stretched on frames, supplies windows and doors. It is highly prized in China and Japan, and is especially sought after for the manufacture of umbrellas. It is made from the bush of the mulberry order (*Broussonetia papyrifera*), which is indigenous, growing in many parts of the kingdom, but thriving best in the moist, warm climate of the south. It is chiefly grown from cuttings for this especial purpose, and the wild and cultivated plants are said to be of equal value. The bark, which alone is used, is generally gathered in the spring, and it is boiled for a long time in water, in which a quantity of wood ashes has been mixed, until it becomes a pulp, the mass having been beaten during the whole time of the boiling. Fine bamboo screens are then placed in shallow wooden vats, and a ladleful of the pulp is evenly spread over the screen by a dexterous circular motion of the hand. This operation is repeated once or twice, or as often as may be necessary—the more frequent the operation, the finer the paper—and the screen allowed to drain into the vats, until a proper consistency is reached, the drippings being thus saved. They are placed on a hot *kang* floor to dry. After the drying has proceeded far enough, the paper is laid on a hot floor, and ironed by hand. The long lines in the paper show strands of the bamboo screens, and their nearness, distinctness, or absence indicate the fineness or otherwise of the paper. They are almost imperceptible in some grades of paper, while in others they are distinct and far apart. Paper is made by the Paper Guild, a numerous and prosperous association. The province of Chulla is the chief seat of manufacture.

— The statement is sometimes made, that, owing to the homogeneity of steel, a bar of this metal with a surface crack or nick in one of its edges is liable to fail by the gradual spreading of the nick, and thus break under a very much smaller load than a sound bar. With iron it is contended this does not occur, as this metal has a fibrous structure. Even the late Sir William Siemens supported this theory, and likened a bar of steel to one of indiarubber, which, as everyone knows, is greatly weakened by a nick in one of its edges. Sir Benjamin Baker has, however, shown that this theory, at least so far as statical stress is concerned, is opposed to the facts, as he purposely made nicks in specimens of the mild steel used at the Forth Bridge, but found that the tensile strength of the whole was thus reduced by only about one ton per square inch of section. This settled the matter so far as statical stresses are concerned, and we now find in a recent number of *Engineering News*, an account of an experiment carried out by the Union Bridge Company, in which a full-sized steel counter-bar, with a screw-turned buckle connection, was tested under a heavy statical stress, and at the same time a weight weighing 1,040 pounds was allowed to drop on it from various heights. The bar was first broken by ordinary statical strain, and showed an ultimate breaking stress of 66,800 pounds per square inch, with an elongation of 29.17 per cent on 12 inches. The reduction of area at fracture was 52.4 per cent. The longer of the broken parts was then placed in the machine and put under the following loads, whilst a weight, as already mentioned, was dropped on it from various heights at a distance of five feet from the sleeve nut of the turn buckle as shown below:—

Stress in pounds per square inch...	50,000	55,000	60,000	63,000	65,000
	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
Height of fall.....	2 1	2 6	3 0	4 0	5 0

The weight was then shifted so as to fall directly on the sleeve nut, and the test proceeded as follows:—

Stress on specimen in pounds per square inch.....	65,250	65,250	66,800
	ft.	ft.	ft.
Height of fall.....	3	6	6

It will be seen that under this severe trial the bar actually carried more than when originally tested statically, showing that the nicking of the bar by screwing had not appreciably weakened its power of resisting shocks.

— The Councillor of Exploration of the Appalachian Mountain Club asks the assistance of members of the club during the coming season. Record of exploration in any part of the country will be welcome. In the White Mountains the whole region drained by the East Branch of the Pemigewasset needs exploration, especially in regard to the details of ravines, ridges, and minor summits; Mounts Thompson and Hastings have not yet been visited; and the region north and east of the Androscoggin has had but little attention except in the neighborhood of Gorham and Shelbourne. Members are requested to forward accounts of their visits to all places outside of the track of the ordinary tourists to A. L. Goodrich, Salem, Mass.

— The president of the Commission appointed to collect funds for the erection of a monument to the late G. A. Hirn, at Colmar, Alsace, are calling in the subscriptions, which are now nearly sufficient for the purpose. American subscribers should immediately send theirs to the nearest collector in this country. The sums subscribed abroad amount to from a few marks to several hundred, according to the ability of the subscribers. None is so poor but that he can add his mite. It is hoped that the opportunity to testify, in this country, the appreciation of America and of Americans, and their desire to honor the great genius of Alsace will be taken full advantage of. Contributions may be sent either directly to the president of the Commission, Mon. G. Kern, Colmar, or to either member of the committee in this country. The privilege of taking part in this movement is one not to be measured by money. Numerous small contributions are more desired by the management than a few large ones, and every friend and admirer of Hirn should send his mite.

— Since 1883, says the *Scottish Geographical Magazine*, the Dutch Government has been carrying out a triangulation of Western Sumatra, and at the end of 1890 the network had been extended over an area of more than 10,000 square miles, while some points had been determined in the northern part of the Padang lowlands and the south of Tapanuli. The base-line extends from Gunung Gadut to Pulau Satu, and is about 112,504 feet, but owing to a probable error of more than 3½ feet, it must be measured again.

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For Advertising Rates apply to Henry F. Taylor, 47 Lafayette Place, New York.

A BRIEF STUDY OF THE PALENQUE TABLET.

In order to assist students in their efforts to interpret the inscription on this tablet, I notice here some discoveries which may possibly lead to valuable results in this direction. However, to bring this article into proper limits and avoid the necessity of introducing tables and diagrams, I must take it for granted that the readers have access to my "Study of the Manuscript Troano" and to Dr. Rau's "Palenque Tablet" and refer them thereto. The only figures referred to are that of the entire tablet, and the photograph of the right slab, both in Dr. Rau's work. A copy of the first will also be found in my "Study MS. Troano." I will also have occasion to refer to the Calendar Table V, p. 11, and the diagram of Dr. Rau's figure of the tablet, on p. 199, of the "Study MS. Troano."

The order in which the characters on the tablet are to be read is as given in the same work, pp. 200–201. That is to say, the columns are taken two and two, commencing at the top and reading from left to right across the two until the bottom is reached, then going to the top of the next two which stand to the right. Thus it will be seen that the character at the bottom of the second column will be followed by the top character of the third column, the bottom one of the fourth by the top one of the fifth. As we will have occasion to refer only to the columns at the sides, it is unnecessary to refer to the central portion.

The particular point to which I wish to call attention at present is that the particular manner of reckoning the days of the month, found in some of the series of the Dresden Codex, notably the extensive one on Plates 46–50, is found on this tablet. The peculiarity of this method is that the day of the month is counted not from the first of the given month, but from the last of the preceding month; thus, the fifteenth day of Pop, beginning the count with the first, will, according to this method, be numbered 16.

I will now refer to the tablet to confirm this statement.

Turning to the right slab and to our diagram (Study MS. Tro., p. 199) we observe that the columns of this part are taken in pairs thus: ST, UV, and WX. The character 10 S is 11 *Lamat*. The little loops by the side of the outer 1 of the 11 are apparently of no significance, being left as mere ornamental supports or protection to the single numeral. I will not stop at present to give the proof of this, as the student will soon learn it for himself. Moreover, it is evident that they form no part of the numerals and hence have no bearing on the question now before us. The character 10 T, immediately to the right of the 11 *Lamat* above mentioned, is beyond question, 6 *Xul*. The two characters taken together are to be interpreted "11 Lamat the 6th day of the month Xul." Turning now to our Calendar Table (Study MS. Tro., p. 11) we see that Lamat is never the 6th day of the month according to the usual method of counting, but is the fifth day of the month in the Kan years. If the count were to begin with the last day of the preceding month it would then be the 6th, as here numbered.

Characters 17 T and 1 U form another pair. The first (17 T) is unquestionably 8 Ahau, but the month symbol, 1 U, has not been determined; however, the number attached to it is clearly 13. Ahau is never the 13th day of the month but is the 12th in Muluc years. Here, again, counting from the last day of the preceding month agrees with the numbering on the tablet. Symbols 17 U and 17 V are 5 Kan the 12th day of the month — ? — (probable Kayab as the character contains the phonetic elements *k* and *b*). Kan is the 11th day of the month in *Ix* years, therefore the same method of numbering is followed in this instance.

We notice a few other examples briefly.

Symbols 5 X and 6 W. — The first 1 Ymix, the second the 4th day of the month — ? —. Ymix is the 3d day of the months in the Cauac years. We refer next to 10 X and 11 W; the first is 7 Kan, the second the 17th day of the month — ? — (possibly *Uo* or *Mol*). Kan is the 16th day of the month in Muluc years. Attention is called next to 8 T and 9 S; where the first is 1 Kan and the other the 2d day of the month, — we have suggested may be Kayab. Kan is of course the first day of Kan years, but is never the second day of a month. In 7 U and 7 V we have 3 Ezanab, the 11th day of the month Xul. Ezanab is the 10th day of the month in Muluc years.

Turning now to the left slab of the tablet we notice the following, though with less assurance than in reference to those named, as here we have no photograph. The first two we call attention to are 16 A and 16 B, the first of these is 1 Ahau, the second the 13th day of the month Xul (?). Ahau is the 12th day of the month in Muluc years. Next 3 D and 4 C. The first of these is 4 Ahau, the second the 8th day of the month — ? — (probably Cumhu). Ahau is the 7th day of the month in the Ix years. Next 9 C and 9 D. Here the first is 13 Ik, the second has no number attached to it, hence we can only guess that it is a month symbol; nevertheless, it is a curious coincidence that precisely the same method of notation is found once on plate 48 and twice on plate 50 of the Dresden Codex, no number-symbol being attached where the day is, according to this method of counting the 20th of the month. As Ik is the 19th day of the month in the Kan years, it would, according to this method, be counted the 20th, and no number-symbol would be given. I think it possible that the symbol 9 D is that of the month Pop. The

pair immediately to the right, 9 E and 9 F, in which the first is 9 Ik, present the same peculiarity.

Referring to 1 E and 1 F, we see 9 Ik, and the 15th day of the month. Ik is the 14th day of the month in the Muluc years.

These examples are sufficient to render it more than probable that the method of numbering the days of the month on this tablet is as suggested. If so it limits very greatly the field of search for the interpretation of the unknown characters following the days mentioned, as we have a satisfactory reason for believing they are month symbols.

This, however, is not the only advantage gained. Take, for example, the symbols 10 S and 10 T, in regard to which there is no reasonable doubt. These indicate 11 Lamat, the 6th (5th) day of the month Xul. This combination can only occur once in a cycle of fifty-two years, to wit, in the year 10 Kan. From this and what is stated above we can safely infer that the four-year system and consequently the year of 365 days was in use in this ancient city when the tablet was made. These facts, if such they be, and the evidence of the peculiar method of numbering the days of the month, lead to the inference that there were intimate relations between the people of this city and those where the Dresden Codex was written, and that there is no very great difference in the ages of the two documents.

I can give other data in reference to the interpretation of this noted inscription, but will not ask further space in *Science* at this time. I will simply add that the phonetic value of the *hand* symbol which so frequently occurs is probably *Ch*.

CYRUS THOMAS.

THE NEW ELEMENT, MASRIUM.[1]

FURTHER details concerning the new element, whose probable existence was announced in a paper communicated to the Chemical Society at their meeting on April 21, are contributed to the number of the *Chemiker Zeitung* dated May 11. The mineral containing the new substance was discovered in 1890 by Johnson Pacha in the bed of an old river in Upper Egypt long since dried up, but of the former existence of which there are records dating back some 6000 years. Indeed, the name by which it is known in the neighborhood is "Bahr-bela-Mā," or "river without water." Here and there in the track of the old watercourse are small lakes whose water is of considerable repute for its medicinal value. Specimens of the mineral were sent by Johnson Pacha to the Khedivial Laboratory at Cairo, where it was examined by Messrs. H. Droop Richmond and Hussein Off, the authors of the paper laid before the Chemical Society. The mineral is found to be a fibrous variety of a mixed aluminium and iron alum containing ferrous, manganous, and cobaltous oxides. In addition, however, to these ordinary constituents, a small quantity of the oxide of another element would appear to be present, having properties entirely different from those of any yet known. This element the discoverers have termed *masrium*, from the Arabic name for Egypt, and the mineral has accordingly received the name of *masrite*. The symbol adopted for masrium is Ms.

The composition of masrite may be expressed by the formula $(Al, Fe)_2O_3 . (Ms, Mn, Co, Fe)O . 4SO_3 . 20H_2O$. The amount of masrium present is very small, averaging only about 0.2 per cent, but by working upon fifteen kilograms of the mineral a considerable quantity of the element in the form of various salts has been accumulated. A typical analysis of masrite published in the Proceedings of the Chemical Society is as follows:—

Water	40.35
Insoluble matter	2.61
Alumina	10.69
Ferric oxide	1.63
Masrium oxide	0.20
Manganous oxide	2.56
Cobaltous oxide	1.02
Ferrous oxide	4.23
Sulphuric oxide	36.78
	100.00

Suspicions that the mineral contained some hitherto unknown constituent were first aroused by the fact that when it was dissolved in water, and sulphuretted hydrogen was passed slowly through the solution in presence of acetic acid, instead of the expected black precipitate of sulphide of cobalt a white insoluble substance was first precipitated. This white precipitate continued to form until the new substance in the solution was all used up, when black sulphide of cobalt began to be thrown down. By decantation before the formation of the latter, and subsequent washing with dilute hydrochloric acid, the white substance was isolated in a state of tolerable purity. It was found to dissolve in boiling nitrohydrochloric acid. The solution in *aqua regia* was evaporated in order to remove the excess of acid, and ammonium hydrate added, when a voluminous white precipitate of the hydrate of the new metal was thrown down. The hydrate was washed by decantation, and subsequently dissolved in the minimum excess of sulphuric acid. The solution of the sulphate of the new metal was next evaporated to syrupy consistency, water was added until complete solution was just effected, and the solution mixed with an equal bulk of alcohol. The effect of this addition of alcohol was to cause immediate precipitation of crystals of the sulphate of the new metal, a further crop of which was also obtained upon evaporation. By repeated recrystallization most of the small quantity of iron present was removed. In order to eliminate the last traces of admixed ferrous sulphate, the crystals were redissolved in water, and excess of sodium hydrate added. As the hydrate of the new metal is soluble in excess of soda, the hydrated oxide of iron was readily removed by filtration. Upon the addition of ammonium chloride the white hydrate was precipitated in a gelatinous form; the hydrate was redissolved in hydrochloric acid, and again precipitated and washed. The almost perfectly pure hydrate so obtained was then finally converted to chloride by solution in hydrochloric acid.

In order to obtain data as to the atomic weight of masrium the following determinations were made. A known quantity of the chloride solution was precipitated by ammonia, and the hydrate thus obtained was ignited, and the remaining oxide weighed. A second portion was precipitated by a solution of microcosmic salt in presence of ammonia, and the phosphate obtained ignited and weighed. The chlorine contained in a third portion was determined by means of silver nitrate in the ordinary manner. From the numbers so obtained the equivalent of masrium was calculated. A pure preparation of masrium oxalate was also obtained by precipitating the neutral solution of the chloride with ammonium oxalate, masrium oxalate resembling the oxalate of calcium in being insoluble under such conditions. The precipitated oxalate was washed, dried, and ignited in a combustion tube whose forward end was filled with copper oxide, when the salt was decomposed with elimination of its water of crystallization, which was absorbed and weighed in the usual manner. The residual oxide was also weighed,

[1] From Nature.

and the oxalic acid, in another quantity of the salt, was determined by means of a standard solution of potassium permanganate. The crystals of the oxalate were thus found to contain 52.70 per cent of masrium oxide, 15.85 per cent of oxalic anhydride, and 31.27 per cent of water.

From the whole of the analytical data yet obtained, assuming, as the reactions of the salts would indicate, that masrium is a divalent element, the atomic weight would appear to be 228. An element of atomic weight about 225 is, indeed, required to occupy a vacant place in the periodic system in the beryllium-calcium group, and masrium appears likely to be the element in question.

Masrium has only yet been observed to combine with oxygen in one proportion, to form the oxide MsO. Masrium oxide is a white substance much resembling the oxides of the lime group. The chloride, $MsCl_2$, is obtained upon evaporation of a solution of the oxide or hydrate in hydrochloric acid. The nitrate, $Ms(NO_3)_2$, crystallizes from 50 per cent alcohol, and the crystals contain water, the amount of which has not been determined. The sulphate, $MsSO_4 . 8H_2O$, is a white salt which crystallizes badly from water, but which separates in well-developed crystals from 50 per cent alcohol. It combines with sulphate of alumina to form an alum, also with potassium sulphate to form a double sulphate. The oxalate above referred to, $MsC_2O_4 . 8H_2O$, is a white salt, soluble in acetic acid, and also in excess of masrium chloride.

The most important reactions of the salts of masrium, as far as they have yet been studied, are the following. Sulphuretted hydrogen produces no precipitate in presence of hydrochloric acid, but yields a white precipitate in presence of acetic acid. Ammonia precipitates the white hydrate of masrium from solutions of the salts; the hydrate is insoluble in excess of ammonia. Ammonium sulphide and carbonate produce white gelatinous precipitates, likewise insoluble in excess of the reagents. Ammonium phosphate yields a white precipitate of phosphate. Caustic alkalies precipitate the hydrate, but the precipitate is readily soluble in excess of the alkaline hydrate. Potassium ferrocyanide produces a white precipitate which is soluble in excess of masrium chloride, but not in dilute hydrochloric acid. Potassium ferricyanide yields no precipitate. Potassium chromate precipitates yellow chromate of masrium, which is soluble in a further quantity of masrium chloride. Potassium tartrate yields a white tartrate precipitate which dissolves in excess of the reagent, but the solution is not reprecipitated by the addition of ammonia.

Metallic masrium has not yet been obtained. Attempts to isolate it by heating the chloride with sodium under a layer of common salt, and by the electrolysis of a solution of the cyanide proved unsuccessful. The chloride, moreover, is not sufficiently volatile to permit of its vapor density being determined.

From the above interesting reactions, however, it will be evident that masrium possesses a strong individuality, although on the whole behaving somewhat like the metals of the alkaline earths and those of the zinc group. Further work will doubtless afford more definite information concerning its nature and properties. A. E. TUTTON

SOME NOTES ON THE VICTORIA NYANZA.

THE following observations on the Victoria Nyanza have been sent to the Royal Geographical Society by Mr. Ernest Gedge, who has spent a considerable time on the lake and in its neighborhood: "The appearance of the lake suggests the formation at some remote period of a vast trough or valley; the western coasts give striking indications of this, especially in Karagwé, where the cliffs come sheer down with deep water close in shore. Inland, behind these, can be noticed a succession of lines of fault, running parallel to one another, forming a series of terraces or steps, which finally culminate in the high grassy plateaus stretching away westwards. There is nothing either on this side or on its southern shores suggesting volcanic action; the geological structure consisting for the most part of gneissic formations and schists, with enormous boulders of porphyritic granite, the latter constituting the most prominent feature on its southern coasts, as well as forming a remarkable island in the lake, known as the "Makoko" or white rocks. On the northern shore outcrops of honey-combed iron stone and lava blocks are to be seen, and this change in the geological structure is accompanied by a corresponding change in the vegetation, from the sterile arid wastes so characteristic of the southern coasts, to rich tropical growth. The main visible sources of the water supply for this great reservoir are the Kagera, Nzoia, and Ngure Darash rivers; and these, though continually discharging a certain amount of water into the lake, are of no great size, except during the rainy season, appearing totally inadequate to maintain the equilibrium of the lake, when we consider the volume of water constantly being carried off by the Nile, as well as the loss that must be caused by evaporation from so large an area. This would lead one to suggest the existence of springs to make up the deficiency. The lake is of great depth in places, and the water fresh and clear, though flat and insipid to drink. Fish are plentiful, being mostly caught with a rod and line, the nearest approach to netting being a screen of grass mats, used as a sieve by the people in Lower Kavirondo, and the basket traps used by the Ba-Sesse. Amongst others is a Silurus, which has evidently been mistaken for the porpoise, owing to its shiny black body, and its habit of coming to the surface and indulging in porpoise-like gambols in calm weather. Hippopotami are not very plentiful, as they chiefly confine themselves to the coasts and rivers. Those that are found in the open water are, however, extremely vicious and much feared by the Ba-Sesse canoe-men, who, strange to say, are unable to swim. This is no doubt largely due to the fact of the lake being infested with alligators, rendering it dangerous for any one to enter the water. Cyclonic storms of great violence occur at certain seasons, and are most dangerous to small craft. These storms in August usually occur at daybreak, coming from the south-west, with much thunder and lightning. Following the coast-line for a time, they would suddenly sweep across the lake in a north-east direction, raising a tremendous sea, and on several occasions we were in imminent danger of being swamped. During this month I noticed that about 3 A.M. the wind was invariably off-shore, varying from the north-north-east to north and north-west. This would drop about 11 A.M., to be followed by a calm lasting to about 2 P.M., when the wind would again come up and blow strongly, in gradually increasing force, from the south-west to south, dying away again at night about 8 P.M. During November the prevailing wind was from the north-east. One of the most remarkable phenomena I witnessed was the apparent tide observable at irregular intervals, the waves coming in and overflowing the beach in exactly the same way as the tide on the sea-shore, the rise and fall lasting from half an hour to an hour or more. This

has occurred during a comparative calm on some occasions, whilst on others, though a strong gale has been setting inshore, I have not noticed any difference in the lake's level, so it would seem that this occurrence is not altogether attributable to the wind backing up the water. Another curious feature is the periodical rise and fall which, according to the natives, takes place every twenty-five years, and which is shown by the water-marks on the shores. At the time of my visit the lake was between eight and nine feet below high-water mark, and the people told me that certain lands then under cultivation would again be flooded in due season, and that the peninsula on which my camp was pitched would again become an island." Similar changes of level have been noticed, both in Lake Tanganyika and Lake Nyassa, and it is very desirable in the interests of geography as well as the development of the continent that continuous observations should be made, in order to discover what is the real character of these changes.

LETTERS TO THE EDITOR.

**** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

The Relative Hardness of Cut Diamonds.

WILL you allow me to add the result of my experience to the testimony of Mr. Kunz that the hardness of diamonds is not perceptibly reduced by cutting and polishing? In the earlier years of my experience in ruling upon glass I was accustomed to select a gem with a smoothly glazed surface, and, splitting the stone in a cleavage plane inclined at a rather sharp angle to the natural face selected, this split face was then ground and polished.

In this way I was able to obtain at several points short knife-edges, which gave superb results in ruling. It was soon found, however that after ruling several thousand rather heavy lines the diamond was liable to lose its sharp cutting-edge, and this experience became so frequent that I was compelled to resort to the method now employed, that of grinding and polishing both faces to a knife-edge. I have one ruling diamond prepared in this way, which has been in constant use for four years, and its capacity for good work has not yet been reduced in the slightest degree.

A diamond prepared by Mr. Max Levy of Philadelphia has given even better results, and so far it shows no evidence of wear.

WM. A. ROGERS.

Colby University, Waterville, Me., June 6.

The Notion of Four-Fold Space.

IN a paper by Professor T. Proctor Hall, entitled "The Possibility of a Realization of Four-fold Space," a digest of which appeared in *Science* for May 13, the author, after making certain allusions, remarks "there is therefore nothing inherently absurd or improbable in the supposition that any of us may attain to a concept of four-fold space 'as clear as the designer and the draughtsman have of three-fold space.'" The word "therefore" refers to what immediately precedes, and here we read: "Perhaps most of us can remember times in the course of our education when new conceptions of quantity entered into our conscious life, conceptions which correspond in a general way with those of length, area, and volume, in that they enable us to find at once such relationships as are most frequently required for practical purposes by a general, synthetic, instinctive method .... The sense of propriety, the sense of honor, and numberless other 'inbred' or 'instinctive' concepts are examples of this mental tendency." There is no such connection, however, between this and the succeeding paragraph, quoted above, as to justify the assertion made with reference to the conception of four-fold space, and the utmost that can be properly inferred is, that, in the words of the following sentence, "such a conception would be of great value to all classes of scientists"—assuming always that it is a possible conception, that is, possible to us with our present mental constitution. I do not propose to enter into this question, but it seems to me that Professor Hall's argument is open to criticism in other respects.

For instance, he does not sufficiently meet the objection based on the fact that "our conception of three-fold space is derived directly from sensations in three-fold space, and that the conception of four-fold space cannot be derived in a similar way, nor yet from sensations in three-fold space." It may be admitted that from the sense of sight we get only a two-dimensional sensation, and that the existence of a third dimension is solely a matter of inference. Yet, this inference has a physiological basis, and is justified by universal experience in past and present generations, so that we know that it expresses the truth. The conditions relative to the conception of four-fold space are quite different. There are apparently no grounds on which a fourth dimension can be inferred, and so far from such an inference being in accordance with experience, this entirely opposes it. To render the truth of such an inference probable, it would have to be shown that the existence of a third dimension is inferred solely from that of two-dimensional space, and yet even then, as the conception of a three-fold dimension would be supported only by that of a two-fold dimension, it would hardly form a sufficient basis for the existence of a fourth. In fact this would ultimately, like the second, be based on the conception of two-fold space.

The conditions of the question are such that the hypothesis of a fourth dimension cannot be made as real to us as that of the existence of a third dimension; any more than Professor Hall's plane being, that is, a being who has no conception of volume, could understand a geometric solid. It is one thing for a person who knows all about three-dimensional space to explain how an imaginary plane being might be able to form such a conception, but a totally different thing for the plane being to perform the operation. The conduct of animals shows that they act according to the same view of space that we do, and yet none of them could form any idea of the relations of the faces of a cube, although propably some very clever dogs can be taught the number of its faces. How much less could any plane being form an idea of those relations. In suppositious cases of this kind, it is always assumed that the imaginary being would be limited only in his ideas of space, but surely this notion is erroneous. A being thus deficient would, by virtue of the law of organic correlation, be equally deficient in other respects, and would rank in an inferior grade of organic development. Such being the case, it is impossible to imagine a plane being acting as a three-dimensional philosopher, and constructing a theory of the evolution of circles, true or false.

It seems to me that those who endeavor to imagine the possibility of four-dimensional space look in the wrong direction. It is very questionable whether, as we are at present constituted, we can possibly form any such idea of space, but there is another view which is worthy of consideration. We know space only in relation to formed matter, and if such matter were to disappear, space would, as so related at least, disappear also. According to present conditions such a state of things would seem to be highly improbable, but we can nevertheless, from what we know of the past, conceive its possibility. If we trace the evolu ional stages of organic nature back through the higher animals from man we reach the worm, from which, according to Haeckel, they have all sprung. Going still further back we come to the primitive moneral ancestor of all organic existence on the earth. But we can retrace the path of evolution beyond the primordial slime, until we arrive at its beginning when, says Professor Crookes, "primitive matter was formed by the act of a generative force, throwing off at intervals of time atoms endowed with varying quantities of primitive forms of energy." Before this there existed, we are told, the formless fluid, from knots and voids in which the chemical elements were formed.

But what has had a beginning can come to an end, and we can imagine therefore all organic and inorganic forms being reduced to the primitive elements, and these elements themselves resolved into the formless fluid from which they were derived. Professor

Crookes says, indeed, "that the atoms are not eternal in existence, but share with all other created beings the attributes of decay and death." They cannot be dissolved into nothing, however, and the only condition they could assume would be that of the formless fluid from which they originally emerged. If this were to happen, matter as we know it would cease to exist, and material or three-dimensional space would with it disappear.

Such a change as is here supposed would be one of pure negation, that is, it would be the negation of all material existence. And yet it would not be absolute negation. It might be described as the absence of position. Every past stage of evolution is negative to that which immediately succeeds it, and yet it is positive to that which has gone before; so that if we go back to the beginning of evolution, the earliest negation is the most real of all existences, because it is that from which all other existence has been derived. Thus formed matter in ceasing to exist as such, and in being resolved again into the primitive formless fluid, would yet continue to exist in a negative state, that is, in its original formless condition, as to the nature of which we can frame no clear idea, beyond that it would be non-material and invisible. Probably we should be justified in considering it the same as the ether.

The existence of the ether is as real as that of formed matter, judging from the phenomena of light, and for that we know there may be ethereal existences which are not subject to the laws which affect that matter. It may be, moreover, that the ether furnishes the link which unites individuals so as to form "genetic or race relationships," and that it conceals the world of spirits, if such exists, from material gaze. The race unity which Professor Hall refers to may, indeed, be conceived of as consistent with, and as even requiring the continued existence of, individuals; just as the existence of a wire depends on that of its constituent molecules. Thus the death of an organism may include a change, unless it be simply a *return*, to a state of immateriality and, therefore, of invisibility. If so, such a negative existence may be the end of all things, material as well as organic; and, since complete change of form often, as in the case of destruction by fire, takes place rapidly, there may be conditions under which, instead of as Professor Hall imagines a plane being stepping out of our space and re-entering it again, matter may suddenly become invisible, that is, be reduced to a state of formless fluid, and again become visible. Under such a condition, all the phenomena which it is supposed the existence of four-fold space would render possible, could be equally well produced without it. The erratic nature of ghosts even would be explainable on the assumption that ethereal existences have the power, under special circumstances, of making use of the physical forces so as to render themselves visible. This is, however, beside the real question, which is the possibility of a state of relatively negative existence, which, although invisible to us, is as real as that on the material plane.

C. STANILAND WAKE,

349 North Clark St., Chicago, June 1.

The Possibility of a Realization of Four-Fold Space.

DR. HALL'S argument for this possibility (*Science*, May 13, 1892) turns upon two other possibilities: first, upon the possibility of building up the conception of this kind of space from that which we already know; and, second, on the possibility of making such a conception so perfect that it may fairly be said to be realized. In support of the first he instances the visual perception of space in which we are supposed to get three fold space by inference from a plane image. Many psychologists, however, contend that such a constructive inference is quite impossible, and others believe that it is only made possible in the case of vision by the aid of touch. Even those that admit a construction of the sort required, can hardly deny that it occurs in the very beginning of babyhood, a fact that points to a racial rather than an individual acquisition. It appears, therefore, to be extremely doubtful whether Dr. Hall could get a four fold space conception built up in a single generation, if at all; that is, if it is to be realized in anything like the degree in which we realize three-fold space.

If, however, by realization is meant only a tolerably complete knowledge about four-fold space,—such, for example, as a deaf physicist could get of sound,—it may be possible to realize it; and Dr. Hall has undoubtedly taken the right road. But knowledge about a thing seems to come somewhat short of realization of it. Some sensory element is also required, and especially verification by touch, which is the sense of last appeal in cases of doubtful reality. Dr. Hall's models would appear to this sense as unquestionably three-fold as a perspective drawing would appear plane.

In regard to the benefits of a full knowledge of four-fold space, Dr. Hall should not allow himself to hope too much. A really clever and elusive ghost would never stop at four-dimensions, but would surely lead him, Will o'-the-wisp fashion, through all the series of *n* dimensions.

EDMUND C. SANFORD.

Clark University, Worcester, Mass., June 6.

Eskimo Throwing-Sticks.

IN my pamphlet on the Eskimo Throwing-Sticks I drew attention to the fact that they are all right-handed save two from the Alaskan Peninsula and that neighborhood. I also mentioned two specimens afterwards described by Ensign Niblack from the T'lingit area in south-eastern Alaska. I neglected to mention that they are ambidextrous, and so is a beautiful specimen from the Vancouver collection, figured by Mr. Charles H. Read in the *Journal of the Anthropological Institute* (Vol. XXI., pl. xi.), bilaterally symmetrical and, doubtless, ambidextrous. In British Columbia and Washington the long-handled fish-spear is ambidextrous, and has two finger-notches on the end, answering to, if not derived from, the form further south. Mr. Read's specimen from Santa Barbara, Cal., is an abbreviated specimen of like form to one lately recovered from Lake Patzcuaro, Mex., by Captain John G. Bourke, U.S.A., suitable for either hand. Looking over the interesting pamphlets of Mrs. Nuttall and Messieurs Stolpe, Uhle, Bahnson, Seler, and de Mortellet, I find most of the spear-throwers or throwing-sticks adapted to either hand. The ornamentation throws a considerable amount of uncertainty over the elaborate forms, but, omitting the Eskimo examples, all other spear-throwers appear to be ambidextrous. Indeed, I should like to inquire whether outside of the Eskimo area any American aborigines had apparatus that would not fit either hand.

Hasty conclusions are dangerous, but we may be allowed to say that the development of a purely right handed implement points to a southern origin for the original invention. At any rate, the atlatl is assuming an enviable importance in comparative technography. While upon the subject I should like to draw attention to the Mexican artist's fashion of pulling certain parts of a solid body into the foreground, as in the heart-shaped finger-pocket or grip on the bottom of the atlatl, always exhibited on the side. Notice is also called to the fashion of shortening objects to get them into a picture; for example, in many cases a harpoon with a shaft ten feet long is represented with all its parts in as many inches.

O. T. MASON.

Washington, D.C., June 7.

AMONG THE PUBLISHERS.

THE Scientific Publishing Company, 27 Park Place, New York, have in press Dr. Endlich's "Manual of Qualitative Blowpipe Analysis."

— William R. Jenkins, New York, has just issued "Parasites and Parasitic Diseases of the Domesticated Animals," by L. G. Neumann, professor at the National Veterinary School of Toulouse, translated and edited by George Fleming.

— Harper & Brothers have nearly ready a book which doubtless will provoke no little discussion and controversy. In is entitled "The Puritan in Holland, England, and America," by Douglas Campbell, who claims that the last word regarding the Puritan settlers of New England has not yet been written, and that many of the prevalent ideas concerning the earlier influences upon the political, social, and religious life of the American people are susceptible of revision.

— Charles Scribner's Sons will publish shortly a book on Norse history, industries, literature, and social life, etc., entitled "Norway and the Norwegians," by C. F. Keary, an authority on the land of the Vikings; an important and entertaining volume, entitled "Conversations and Correspondence with Thomas Carlyle," by Sir Charles G. Duffy; "Principles of Theoretical and Practical Logic," by Professor J. H. Hyslop of Columbia; and a book called "First Aid in Illness and Injury" (written and illustrated by Captain James E. Pilcher, U.S.A.), the purpose of which is to supply instructions that anyone can understand, for the emergencies and accidents that the human machine is liable to.

— *Babyhood* contains in its June issue an article on "Infantile Grief," in which the writer, Dr. J. M. W. Kitchen, relates the results of his investigations into a baby's cry. Dr. D. Warman speaks of the heart affections of children due to over-exertion, and describes several striking cases in which the heart was affected by rope-jumping and sudden fright. Other medical topics are discussed. The mothers themselves write in the "Parliament" about the best way of putting children to sleep, about the careful and the careless way of training the little ones, about purity in the bath, and many other things of interest.

— Houghton, Mifflin, & Co. will publish this month Walter Crane's new book, "The Claims of Decorative Art," papers on "The Structure and Evolution of Decorative Pattern," "Art and Labor," "The Position and Claims of Decorative Art," "Art and Handicraft," "Importance of the Applied Arts and Their Relations to Common Life," and other subjects, illustrated by the author; "Favorite Flies and Their Histories: with replies from experienced anglers to inquiries concerning how, when, and where to use them," by Mary E. Orvis Marbury, with numerous illustrations; the fourth volume of Charles S. Sargent's important work on "The Silva of North America;" "Phases of Thought and Criticism," by Brother Azarias, who has won an enviable reputation for his scholarship and for his clear and attractive style; and the fourth edition, revised, of Edward Stanwood's "History of Presidential Elections."

— Fritz von Szczepanski, the author of the valuable "Bibliotheca Polytechnica" published last year, has just issued a "Bibliotheca Electrotechnica," being a classified and descriptive guide to electrical books published in English, German, and French. The catalogue is divided into thirty-one departments under the following headings: Journals and Annuals; Theory of Electricity and Magnetism; History of Electricity; Electricity in Exhibitions; Batteries and Storage Batteries; Electric Lighting; Electricity in Mining; Bibliography; Lightning Conductors; Electricity in Railways; Military Electricity; Legal Aspect of Electricity; Electro-Chemistry; Electromotors; Galvanoplasty; Electric Bells; Domestic Electricity; Instruments; Electric Transmission of Energy; Conduits; Electric Machines; Measurements; Potential; Statical Electricity; Tables and Formulæ; Telegraphy; Transformers; and Electric Clock Making. The catalogue is a reasonably complete list of modern electrotechnical literature issued since 1888, with data of size, price, and name of publisher, and a full author-index. Published in New York by the International News Company.

— Messrs. Houghton, Mifflin, & Co. have published a work by the Rev. Lyman Abbott entitled "The Evolution of Christianity." Mr. Abbott is enamored of the doctrine of evolution, and, seeing its inconsistency with many things in Christianity, he has endeavored in this volume to give a new interpretation to some of the older doctrines, so as to bring his religion into harmony with the new philosophy. He is not the first to make such an attempt, but we cannot think that he has had much better success than those who have tried the same task before him. He quotes Professor LeConte's definition of evolution as "continuous progressive change, according to certain laws, and by means of resident forces;" he defines religion as "the life of God in the soul of man;" and then endeavors to show that "the Christian religion is itself an evolution." To a certain extent, of course, he has no difficulty in so doing, though we cannot think he has always sketched the development of Christianity correctly. But he insists that Jesus was an exception to the universal law — that he was in no sense a product of evolution. The principal defect of Mr. Abbott's work, however, is its vagueness in matters of doctrine. He avoids the discussion of doctrines as far as he can, and whenever he alludes to them, he leaves us in doubt as to what his real opinion is. We cannot make out even what he thinks about God, his views on the subject of Deity being a compound of Christian theism and German pantheism, with the latter element, it seems to us, predominating. Mr. Abbott's book will suit those whose religion is sentimental rather than intellectual and practical, and will doubtless please the partisans of evolutionism; but it does not even touch the deeper religious problems of the age, and consequently contributes nothing toward the religion of the future.

— During the past year the editor of "Appleton's General Guide" has made a trip over the entire United States and Canada. The information gathered by him has been incorporated in the present edition. Among the new features will be found: 1. Descriptions of routes, resulting from increased railroad facilities. 2. Descriptions of resorts, notably those on the Pacific Coast. 3. The leading cities have all been visited, and the latest information concerning each has been gathered for this work by some special expert. 4. Itineraries of each of the larger cities will be found at the proper places, describing how the salient features may be seen in the shortest space of time possible. 5. New plans and new maps of the environs of the cities have been specially prepared for this edition. 6. The old illustrations give place to new ones procured especially for the present edition. Each year finds an increasing numer of our citizens who desire to know more about their own country, and each year brings an increasing influx of foreign tourists who desire to see those features which are most significantly American. For both of these classes this book is designed.

— Portraits of seventeen American anthropologists will accompany Prof. Frederick Starr's article on "Anthropological Work in America," which is to open *The Popular Science Monthly* for July. The article shows that both in quality and amount the work of Americans in this field compares favorably with that of Europeans, described by Professor Starr in an earlier number. The fifteenth article in the series on the Development of American Industries since Columbus will be published in the July number. It is on "Leather-making," and, like all in the series, it is fully illustrated. The author is Mr. George A. Rich, of the Boston *Journal*. There are illustrated articles on "New England Owls" and certain "Rare Monkeys." A stimulating article on present educational problems will be by Mrs. H. M. Plunkett. It is entitled 'Kindergartens—Manual Training—Industrial Schools," and embodies some principles of training children that have not yet been duly appreciated.

— W. J. Johnston Co., Ltd., New York, have just issued the second edition of Professor E. J. Houston's "Dictionary of Electrical Words, Terms, and Phrases." The first edition of this work was published in 1889, and was the first book which defined and explained electrical terms in such language as could readily be understood by the general public. The second edition is almost entirely rewritten, and is fully twice the size of the first edition. It contains not far from 5,000 distinct titles under which definitions and explanatory matter are given, and nearly as many more titles under which cross-references occur. The treatment of each title includes — first, a brief definition in large type; and, second, explanatory and descriptive matter in smaller type for the benefit of those who wish fuller information than would be given in an ordinary definition. The text is amply illustrated by 570 figures of electrical apparatus. The book is one which cannot fail to be of value to the professional man generally, and also to the intelligent reader of scientific periodicals, as well as of the newspapers and magazines.

— We have received from the J. B. Lippincott Co. "The Proceedings of the first annual Meeting of the National Conference on University Extension," held in Philadelphia last December. The object of the meeting was to discuss the methods appropriate to university extension work and to devise plans for the more efficient conduct of the work hereafter; and the exercises con-

sisted partly of reports of the work already done or in progress in the different parts of the country, and partly of addresses on various topics connected with the subject. Among the reports that of Mr. Henderson, the general secretary, and that of Mr. Dewey on the extension movement in New York State are the most important; while of the addresses we may mention particularly those of William T. Harris on "The Place of University Extension in American Education;" of Michael E. Sadler, of Oxford, on "The Development of University Extension in England;" and of Edmund J. James, the president of the association, on "The University Extension Lecturer." Considerable enthusiasm was manifested among the members present; yet it is plain from what was said that the movement has not yet produced anything approaching the beneficial results of the corresponding movement in England. More than one speaker explicitly stated that hitherto the extension lectures had been chiefly attended by cultured persons, and that "thus far the effort to reach that great portion of the people whose opportunities for education and mental culture have been limited, has failed." This fact, together with the superficiality which is inherent in such a method of teaching, are serious drawbacks; yet if the new movement can accomplish half that its enthusiastic promoters anticipate, we heartily wish it success.

— The ethnography and ethnology of Tierra del Fuego is the subject of the seventh volume, noticed in the *Scottish Geographical Magazine* for May, of the reports on the French Expedition which, in 1882, observed the Transit of Venus. The Onas inhabit the eastern part of the main island; the Alakaluf dwell on the smaller islands on the north-western side of the Archipelago; and the Yaghans, allied physically and anthropologically to the Alakaluf, are found among the southern islands. They are far more numerous than the other tribes, and, as the French station was established in their district, the anthropological observations principally relate to them. The average height of the men is 5 feet 2 inches, and of the women 4 feet 10 inches. The skull is large, comparatively high, and of medium breadth. The face is long and angular, with a narrow, low, and receding forehead. The eyes are small and brown in color, the nose concave with wide nostrils, the mouth broad and the lips thick, and the cheek bones prominent. The upper extremities are proportionally long, and the lower short. The hair is black, straight, and stiff. The skin is yellow, brownish or reddish. The Yaghans are decidedly different in type from the neighboring South American races, and resemble in their corporal peculiarities certain scattered tribes of the centre and north of South America — the Guarani, Coroado, the Aimara of Peru, and, above all, the Botocudo. They are probably remnants of an early sub-brachycephalous race who were scattered by the invasion of the later brachycephalous tribes.

— One of the early issues of D. C. Heath & Co. will be a little volume for primary schools called "Leaves and Flowers," by

CALENDAR OF SOCIETIES.

Appalachian Mountain Club, Boston.

June 8. — E. H. Russell, Camping Out; Thomas Crozier, The Grafton Camp.

Biological Society, Washington.

May 28. — Theodore Gill, On the Super-Family Chætodontoidea; C. Hart Merriam, The Plants of the Pribilof Islands, Coon Cave, Missouri; Frederick V. Coville, Uses of Plants Among the Panamint Indians.

Publications Received at Editor's Office.

National Conference on University Extension. Proceedings of the first annual meeting, Phila., J. B. Lippincott Co. 8°. 292 p. $1.50.

Pilling, James C. Bibliography of the Algonquian Languages. Washington, Government. 8°. 624 p.

Romanes, George J. Darwin and after Darwin. I. The Darwinian Theory. Chicago, Open Court Pub. Co. 12°. 460 p. $2.

Schwab, John C. and Others. The Yale Review. Vol. I., No. 1, May, 1892. Boston, Ginn & Co. 8°, paper. 112 p. 75 cts.

University of Wisconsin. Eighth Annual Report of the Agricultural Experiment Station, for the year ending June, 1891. Madison, State Printers. 8°. 326 p.

U. S. Geological Survey. Contributions to North American Ethnology. Vol. VI. Washington, Government. 4°. 812 p.

Whitney, Henry M. Tourists' Guide through the Hawaiian Islands. Honolulu, Hawaiian Gazette Co. 8°. 176 p. 60 cts.

Wright, Julia McNair. Nature Readers. No. 4 Sea-side and Way-side. Boston, D. C. Heath & Co. 12°. 370 p. Ill. 70 cts.

Societas Entomologica.

International Entomological Society, Zurich-Hottingen, Switzerland.

Annual fee, ten francs.

The Journal of the Society appears twice a month, and consists entirely of original articles on entomology, with a department for advertisements. All members may use this department free of cost for advertisements relating to entomology.

The Society consists of about 450 members in all countries of the world.

The new volume began April 1, 1892. The numbers already issued will be sent to new members.

For information address Mr. Fritz Ruhl, President of the Societas Entomologica, Zurich-Hottingen, Switzerland.

Exchanges.

[Free of charge to all, if of satisfactory character. Address N. D. C. Hodges, 874 Broadway, New York.]

Taxidermist going out of business has quantity of finely-mounted specimens of North American birds, mammals and reptiles and skins of birds for sale, including a full local collection of bird skins, showing some great variations of species; also quantity of skulls with horns of deer and mountain sheep, and mounted heads of same. Will give good exchange for Hawk Eye camera with outfit. Apply quickly to J. R. Thurston, 265 Yonge St., Toronto, Canada.

For exchange.—A fine thirteen-keyed flute in leather covered case, for a photograph camera suitable for making lantern slides. Flute cost $27, and is nearly new. U. O. COX, Mankato, Minn.

To exchange; Experiment Station bulletins and reports for bulletins and reports not in my file. I will send list of what I have for exchange. P. H. ROLFS, Lake City, Florida.

Finished specimens of all colors of Vermont marble for fine fossils or crystals. Will be given only for valuable specimens because of the cost of polishing. GEO. W. PERRY, State Geologist, Rutland, Vt.

For exchange.—Three copies of "American State Papers Bearing on Sunday Legislation," 1891, $2.50, new and unused, for "The Sabbath," by Harmon Kingsbury, 1840; "The Sabbath," by A. A. Phelps, 1842; "History of the Institution of the Sabbath Day, Its Uses and Abuses," by W. L. Fisher, 1859; "Humorous Phases of the Law," by Irving Browne; or other works amounting to value of books exchanged, on the question of governmental legislation in reference to religion, personal liberty, etc. If preferred, I will sell "American State Papers," and buy other books on the subject. WILLIAM ADDISON BLAKELY, Chicago, Ill.

For Sale or Exchange for books a complete private chemical laboratory outfit. Includes large Becker balance (200g. to 1-10mg.), platinum dishes and crucibles, agate motors, glass-blowing apparatus, etc. For sale in part or whole. Also complete file of *Silliman's Journal*, 1862-1883 (62-71 bound); Smithsonian Reports, 1854-1883; U. S. Coast Survey, 1854-1869. Full particulars to enquirers. F. GARDINER, JR., Pomfret, Conn.

Wanted, in exchange for the following works, any standard works on Surgery and on Diseases of Children: Wilson's "American Ornithology," 3 vols.; Coues' "Birds of the Northwest" and "Birds of the Colorado Valley," 2 vols.; Minot's "Land and Game Birds of New England;" Samuels' "Our Northern and Eastern Birds;" all the Reports on the Birds of the Pacific R. R. Survey, bound in 2 vols., morocco; and a complete set of the Reports of the Arkansas Geological Survey. Please give editions and dates in corresponding. R. ELLSWORTH CALL, High School, Des Moines, Iowa.

To exchange Wright's "Ice Age in North America" and Le Conte's "Elements of Geology" (Copyright 1882) for "Darwinism," by A. R. Wallace, "Origin of Species," by Darwin, "Descent of Man," by Darwin, "Man's Place in Nature," Huxley, "Mental Evolution in Animals," by Romanes, "Pre-Adamites," by Winchell. No books wanted except latest editions, and books in good condition. C. S. Brown, Jr., Vanderbilt University, Nashville, Tenn.

Wants.

Any person seeking a position for which he is qualified by his scientific attainments, or any person seeking some one to fill a position of this character, be it that of a teacher of science, chemist, draughtsman, or what not, may have the 'Want' inserted under this head FREE OF COST, *if he satisfies the publisher of the suitable character of his application. Any person seeking information on any scientific question, the address of any scientific man, or who can in any way use this column for a purpose consonant with the nature of the paper, is cordially invited to do so.*

WANTED.—We want any and all of the following, providing we can trade other books and magazines or buy them cheap for cash: Academy, London, vol. 1 to 28, 35, Jan. and Feb., '89; Age of Steel, vol. 1 to 66; American Antiquarian, vol. 1, 2; American Architect, vol. 1 to 6, 9; American Art Review, vol. 3; American Field, vol. 1 to 21; American Geologist, vol. 1 to 6; American Machinist, vol. 1 to 4; Art Amateur, vol. 1 to 7, Oct., '4; Art Interchange, vol. 1 to 9; Art Union, vol. 1 to 4, Jan., '44, July, '45; Bibliotheca Sacra, vol. 1 to 46; Godey's Lady's Book, vol. 1 to 20; New Englander, vol. 11; Zoologist, Series 1 and 1, Series 3 vol. 1 to 14; Allen Armendale (a novel). Raymer's "Old Book" Store, 243 4th Ave. S., Minneapolis, Minn.

WANTED.—By a young man, a Swarthmore College junior, a position as principal of a public high school in one of the Gulf States, or as instructor in botany, physiology, and geology in an academy or normal school. Address B., care of Librarian, Swarthmore College, Penn.

WANTED.—A teacher of Geology who is familiar with the fossils of the Hamilton Group, as instructor of Geology during July next at the Natural Science Camp on Canandaigua lake. Apply to ALBERT L. AREY, Director, 229 Averill Ave., Rochester, N. Y.

WANTED.—To act as correspondent for one or two daily or weekly papers. Have worked on paper for about two years. Would like a position on editorial staff of humorous paper. Address GEO. C. MASON, 14 Elm St., Hartford, Conn.

TRANSLATOR wanted to read German architectural works at sight (no writing). One familiar with technical terms desired. Address "A.," Box 149, New York Post Office.

WANTED.—A position in a manufacturing establishment by a manufacturing Chemist of inventive ability. Address M. W. B., care of *Science*, 874 Broadway, N. Y.

WANTED.—Books on Anatomy and Hypnotism. Will pay cash or give similar books in exchange. Also want medical battery and photo outfit. DR. ANDERSON, 182 State street, Chicago, Ill.

WANTED.—A college graduate with some normal training, to teach the sciences, at $1,800 per year, in a Southern college. A Baptist or a Methodist preferred. Must also be a first-class Latin scholar. A. H. Beals, Box K, Milledgeville, Ga.

ADDRESS WANTED.—Will some one please send the address of the Secretary of the American Philological Society. Also that of Herbert Spencer. "ADDISON," Room 84, 164 Madison St., Chicago, Ill.

Mary A. Spear, late principal of the Model School of West Chester (Pa.) State Normal School. These plant studies combine drill in reading with sound botanical information, calculated to serve as a useful basis to later study. At the same time care is taken that the information shall be obtained by actual observation of leaves, stems, and flowers. A feature of this book is its arrangement, which enables it to be taken up in the autumn, if the study cannot be begun in the spring.

— *Neptunia*, January, 1892, contains a map showing the distribution of Plankton, in the North Atlantic, as far as it was ascertained by the expedition of the Humboldt Stiftung. In an accompanying paper, Herr F. Schütt discusses the result of the expedition.

— We learn from the *Scottish Geographical Magazine* that two handbooks of professional instructions for the trigonometrical and topographical branches of the Indian Survey Department have just been issued from the office of the former at Dehra Dun, in the North-West Provinces. They have been prepared by Colonel G. Strahan, R.E., under the direction of Colonel H. R. Thuillier, R.E., the Surveyor-General, and will prove most useful to the numerous officers of that department, as well as to students and others in this country who contemplate joining the service. Some of the miscellaneous chapters, such as those on the care and treatment of elephants and on the health and management of a party, will be found to have a good deal of interest for the general reader, while the more purely technical parts contain full and instructive information as to the important and miscellaneous scientific tasks which fall to the lot of the Indian surveyor.

— Bret Harte's young daughter, Miss Jessamy Harte, will make her literary début in the July *Ladies' Home Journal* with a most entertaining description of "Camp Life in the Adirondacks," in which it is claimed every evidence shows itself of inherited literary tendencies not unlike those evidenced in Bret Harte's earlier work. Miss Harte is a girl still in her teens, and has artistic as well as literary proclivities, as one of the illustrations accompanying her first article shows.

QUERY.

Can any reader of *Science* cite a case of lightning stroke in which the dissipation of a small conductor (one-sixteenth of an inch in diameter, say,) has failed to protect between two horizontal planes passing through its upper and lower ends respectively? Plenty of cases have been found which show that when the conductor is dissipated the building is not injured to the extent explained (for many of these see volumes of Philosophical Transactions at the time when lightning was attracting the attention of the Royal Society), but not an exception is yet known, although this query has been published far and wide among electricians.

First inserted June 19. No response to date.

N. D. C. HODGES,
874 BROADWAY, NEW YORK.

TO THE READERS OF SCIENCE.

PUBLISHER'S ANNOUNCEMENT.

OUR PLANS.

WITHIN the past six months the use of *Science* by scientific men and women as a medium for prompt publication and weekly discussion, has increased very materially, so that the pages are now well filled each week with original matter. As the number of those promising contributions is increasing at the rate of three or four each day, it cannot be long before *Science* at its present size will be too small for the amount of matter offered. We have under consideration therefore an enlargement of the paper by one-half, but must first learn the temper of our constituency as to an advance in price to $5.00, which was the subscription price from the start for four years, up to June 30, 1887. Further, to carry out the proposed enlargement, we shall need five hundred additional subscribers. If you are not already a subscriber, are you willing to aid in making *Science* more worthy of American scientific work by becoming one?

It goes without saying, that the demand for scientific literature is limited, when compared with that for literature which is more to the public taste, so that the receipts of most of the Scientific Journals, in this country, do not pay quite for their printing and paper, to say nothing of the other items of expense. We say this merely to emphasize the fact, that generous and prompt support must be accorded this move if it is to succeed.

Titles of Some Articles Published in *Science* since Jan. 1, 1892.

Aboriginal North American Tea.
Actinism.
Amenhotep, King, the tomb of.
Anthropology, Current Notes on.
Arsenical Poisoning from Domestic Fabrics.
Anatomy, The Teaching of, to Advanced Medical Students.
Astronomical Notes.
Botanical Laboratory, A.
Brain, A Few Characteristics of the Avian.
Celts, The Question of the.
Collection of Objects Used in Worship.
Deaf; Higher Education of the.
Diphtheria, Tox-Albumin.
Etymology of two Iroquoian Compound Stems.
Eye-Habits.
Family Traits, Persistency of.
Fishes, The Distribution of.
Fossils, Notice of New Gigantic.
Grasses, Homoptera Injurious to.
"Healing, Divine."
Hemipterous Mouth, Structure of the.
Hypnotism among the Lower Animals.
Hypnotism, Traumatic.
Indian occupation of New York.
Influenza, Latest Details Concerning the Germs of.
Infant's Movements.
Inventors and Manufacturers, the American Association of.
Iowa Academy of Sciences.
Jargon, The Chinook.
Klamath Nation, Linguistics.
Lightning, The New Method of Protecting Buildings from.
Lissajou's Curves, Simple Apparatus for the Production of.
Maize Plant, Observations on the Growth and Chemical Composition of.
Mineral Discoveries, Some Recent, in the State of Washington.
Museums, The Support of.
Patent Office Building, The.
Pocket Gopher, Attempted Extermination of.
Psychological Laboratory in the University of Toronto.
Psychological Training, The Need of.
Rain-Making.
Rivers, Evolution of the Loup, in Nebraska.
Scientific Alliance, The.
Star, The New, in Auriga.
Storage of Storm-Waters on the Great Plains.
Teaching of Science.
Tiger, A New Sabre-Toothed, from Kansas.
Timber Trees of West Virginia.
Tracheæ of Insects, Structure of.
Vein-Formation, Valuable Experiments in.
Will, a Recent Analysis of.
Wind-Storms and Trees.
Wines, The Sophisticated French.
Zoology in the Public Schools of Washington, D. C.

Some of the Contributors to *Science* Since Jan. 1, 1892.

Aaron, Eugene M., Philadelphia, Pa.
Allen, Harrison, Philadelphia, Pa.
Baldwin, J. Mark, University of Toronto, Canada.
Barnes, Charles Reid, Madison, Wis.
Baur, G., Clark University, Worcester, Mass.
Beal, W. J., Agricultural College, Mich.
Beals, A. H., Milledgeville, Ga.
Beauchamp, W. M., Baldwinsville, N.Y.
Boas, Franz, Clark University, Worcester, Mass.
Bostwich, Arthur E., Montclair, N.J.
Bradley, Milton, Springfield, Mass.
Brinton, D. G., Philadelphia, Pa.
Chandler, H., Buffalo, N.Y.
Comstock, Theo. B., Tucson, Arizona.
Cragin, F. W., Colorado Springs, Col.
Davis, W. M., Harvard College, Cambridge, Mass.
Dimmock, George, Canobie Lake, N.H.
Farrington, E. H., Agricultural Station, Champaign, Ill.
Ferree, Barr, New York City.
Flexner, Simon, Johns Hopkins University, Baltimore, Md.
Fraley, P. Max, Rochester, N.Y.
Gallaudet, E. M., Kendall Green, Washington, D.C.
Garman, S., Museum of Comp. Zool., Cambridge, Mass.
Golden, Katherine E., Agricultural College, Lafayette, Ind.
Hale, Edwin M., Chicago, Ill.
Hale, George S., Boston, Mass.
Hale, Horatio, Clinton, Ontario, Canada.
Hall, T. Proctor, Clark University, Worcester, Mass.
Halsted, Byron D., Rutgers College, New Brunswick, N.J.
Haworth, Erasmus, Oskaloosa, Iowa.
Hay, O. P., Irvington, Ind.
Haynes, Henry W., Boston Mass.
Hazen, H. A., Weather Bureau, Washington, D.C.
Hewitt, J. N. B., Bureau of Ethnology, Washington, D.C.
Hicks, L. E., Lincoln, Neb.
Hill, E. J., Chicago, Ill.
Hill, Geo. A., Naval Observatory, Washington, D.C.
Hitchcock, Romyn, Washington, D.C.
Hotchkiss, Jed., Staunton, Va.
Howe, Jas. Lewis, Louisville, Ky.
Hubbard, Gardiner G., Washington, D.C.
James, Joseph F., Agricultural Dept., Washington, D.C.
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